



SILICONES

SUPPLEMENTARY DATA

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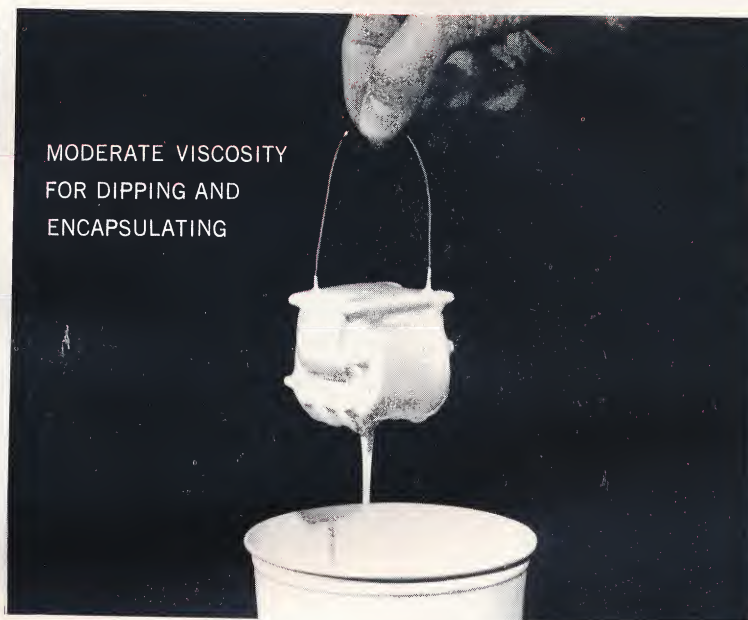
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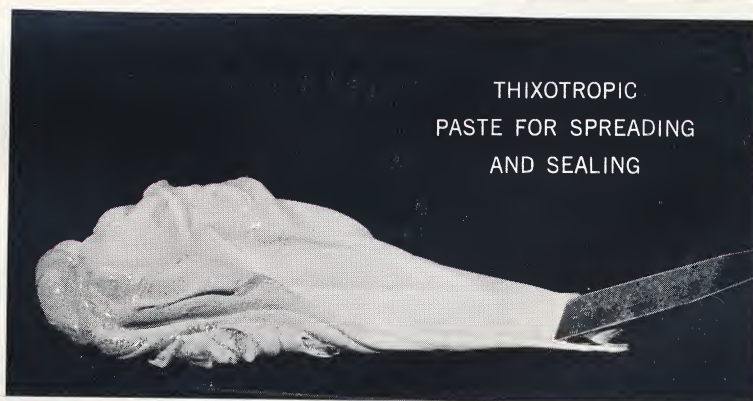
SILICONE RUBBER RTV COMPOUNDS for MIL-S-23586 (Wep)



LOW VISCOSITY
FOR POURING
AND POTTING



MODERATE VISCOSITY
FOR DIPPING AND
ENCAPSULATING



THIXOTROPIC
PASTE FOR SPREADING
AND SEALING

GENERAL  ELECTRIC

SILICONE PRODUCTS DEPARTMENT
WATERFORD, NEW YORK



a complete line of RTV silicone rubber compounds designed to meet MIL-S-23586 (Wep)

SPECIFICATION INFORMATION MIL-S-23586 (Wep)

This military specification covers the requirements for room temperature vulcanizing (RTV) silicone rubber compounds most useful to aircraft and weapons applications. The specification describes the product and performance requirements of RTV silicone rubber compounds for electrical and mechanical applications as materials for potting, encapsulation, sealing and bonding.

PRODUCT SELECTION

General Electric offers a complete range of two-part RTV silicone rubber compounds designed to meet military specification MIL-S-23586 (Wep). Developed with the needs of the user in mind, these new materials make available to industry the broadest selection of

qualified RTV silicone rubber compounds specifically designed to meet this specification.

The RTV-8000 series materials listed below provide by product designation a kit containing the RTV compound with the proper amount and type of curing agent.

DESCRIPTION	PRODUCT	CURE
Low Viscosity	RTV-8111	Fast Cure— Reversion Resistant
	RTV-8112	Medium Cure
	RTV-8113	Slow Cure
Moderate Viscosity	RTV-8223	Slow Cure
	RTV-8243	Slow Cure
	RTV-8262	Medium Cure
	RTV-8263	Slow Cure
Thixotropic Paste	RTV-8372	Medium Cure
	RTV-8373	Slow Cure
	RTV-8382	Medium Cure
	RTV-8383	Slow Cure

Typical Properties — These General Electric two-part RTV compounds tested to MIL-S-23586 have been especially developed to provide the widest selection of viscosities, cure rates and handling properties to meet every application and processing requirement. The products are well suited for all types of industrial applications.

This chart gives typical properties only and is not intended for use in preparing specifications. See certification table.

selector guide

PRODUCTS DESCRIPTION RTV-8111 RTV-8112 RTV-8113 RTV-8223 RTV-8243 RTV-8262 RTV-8263 RTV-8372 RTV-8373 RTV-8382 RTV-8383

Viscosity	Low	Low	Low	Moderate	Moderate	Moderate	Moderate	Paste	Paste	Paste	Paste
Cure	Fast	Medium	Slow	Slow	Slow	Medium	Slow	Medium	Slow	Medium	Slow
MIL-S-23586 Classification											
Type	I	I	I	II	II	II	II	III	III	III	III
Class	1	2	3	3	3	2	3	2	3	2	3
Grade	B	A	A	A	A	A	A	A	A	A	A
Typical Uncured Properties											
Color	White	White	White	Pink	White	Red	Red	White	White	Red	Red
Consistency	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Thixotropic Paste	Thixotropic Paste	Thixotropic Paste	Thixotropic Paste
Viscosity, Poises	120	120	120	250	400	500	500	6000	6000	6000	6000
Non-Volatiles, %	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.
Shelf Life, Months	6	6	6	6	6	6	6	6	6	6	6
Catalyzed Pot Life @ 77°F	15-45 Min	1-3 Hrs	3-7 Hrs	3-7 Hrs	3-7 Hrs	1-3 Hrs	3-7 Hrs	1-3 Hrs	3-7 Hrs	1-3 Hrs	3-7 Hrs
Curing Agent and Level, %	RTV-9891 2-4	RTV-9858 6-8	RTV-9858 2-4	RTV-9858 1-3	RTV-9858 1-3	RTV-9858 5-7	RTV-9858 2-4	RTV-9858 4-6	RTV-9858 1-3	RTV-9858 5-7	RTV-9858 1-3
Typical Cured Properties											
Specific Gravity	1.18	1.18	1.18	1.31	1.31	1.47	1.47	1.33	1.33	1.48	1.48
Hardness, Shore A	45	45	45	50	50	60	60	50	50	65	65
Tensile Strength, psi	350	350	350	550	500	800	800	500	500	750	750
Elongation, %	180	180	180	180	200	130	130	220	220	110	110
Linear Shrinkage, %	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Typical Electrical Properties											
Dielectric Strength, Volts/Mil	500	500	500	500	500	500	500	475	475	480	480
Dielectric Constant @ 10 ³ Cps	3.6	3.6	3.6	3.4	3.6	3.7	3.7	4.0	4.0	4.0	4.0
Dissipation Factor @ 10 ³ Cps	.019	.019	.019	.01	.01	.02	.02	.018	.018	.02	.02
Volume Resistivity, ohm-cm	6x10 ¹⁴	6x10 ¹⁴	6x10 ¹⁴	1x10 ¹⁶	1x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁵	1x10 ¹⁵	1x10 ¹⁴	1x10 ¹⁴

GENERAL APPLICATION AND HANDLING SUGGESTIONS

Mixing

Thoroughly mix the base compound with the specified type and amount of curing agent. Should air entrapment result deaeration is recommended for the liquid materials. When thoroughly mixed apply and allow to cure. Typical 24 hour cure time is sufficient for product handling. MIL-S-23586 specifies a 72 hour cure time prior to final product evaluation or testing.

Curing Agents *

Curing agents RTV-9858 and RTV-9891 have as the active catalyst a liquid metal soap mixed with a suitable silicone base material and inert filler. The result is a curing agent with a pourable paste consistency.

Typical properties of curing agents

Characteristic	RTV-9858	RTV-9891
Color	Off-white — Beige	Light Blue
Consistency	Pourable paste	Pourable paste
Viscosity, Poises	200-600	200-800
Specific Gravity	1.58	1.75
Active Catalyst	Dibutyl Tin Dilaurate	Stannous Octoate

These curing agents contain organotin compounds as the active catalyst. Avoid prolonged skin contact which could result in skin irritation. In case of contact wash thoroughly with soap and water. In case of contact with the eyes, irrigate with water immediately and get medical attention.

Cure Rate and Pot Life

The pot life and cure rate of the 8000 series compounds shown in the property tables have been based on using the suggested amount of curing agent and a cure at room temperature. *Adjustments may be made in the curing agent level to obtain slight variation in both pot life and cure rate.* This involves increasing the curing agent level to speed the cure resulting in a corresponding reduction in pot life.

Pot life and cure rate can be changed by temperature also. Pot life may be extended by refrigerating the catalyzed compound. Cure rate in turn may be speeded up by curing at higher temperatures.

Bonding

All of the RTV compounds described in this data book can be bonded to most metals, plastics, glass, etc. by using a suitable primer. When properly applied, this will result in bonds stronger than the rubber itself.

Primers

For qualification to the adhesion requirements of MIL-S-23586 General Electric SS-4004 silicone primer was used. Other suitable primers are SS-4044 and SS-4101.

The bright, fluorescent pink color of SS-4004 makes it easy to determine whether a uniform coating has been applied. Fast drying solvents (acetone and isopropanol) in SS-4004 speed up its drying time, but these solvents are highly flammable and precautions must be taken to keep the primer away from fire or flame. The low flash point of SS-4004 prevents its being shipped by parcel post, except in sample quantities.

SS-4044 Clear Primer is a clear, colorless primer identical to SS-4004 except for the absence of the red color. The same solvents are employed and the same flammability precautions apply.

SS-4101 Primer is blue in color, available in handy aerosol cans for easy spray application as well as in bulk form for dipping or brushing.

Typical properties of RTV Silicone Primers

Property	SS-4004	SS-4044	SS-4101
Color	Fluorescent Pink	Clear	Blue
Solids, % (45 min. @ 150 C)	15-18	15-18	15-18
Specific Gravity (25/4 C)	0.84-0.86	0.84-0.86	0.92-0.96
Dry Time, hrs.	<1	<1	1 (approx.)

Bonding Procedure

All surfaces to be bonded should be thoroughly cleaned with a suitable solvent such as toluene, xylene, etc. Roughing up the surface with emery paper or sandblasting is not necessary.

SS-4004 or SS-4044 Primers are best applied by brushing or dipping. SS-4101 Primer may be brushed, dipped or sprayed — the spraying may be done by any convenient method, including the handy available aerosol cans. A uniform primer coat of approximately 0.5 to 1 mil in thickness usually provides the strongest bonds. When SS-4004 is used, the surface should be uniformly colored a light pink— *a dark red-pink color indicates too much primer; a light, almost colorless pink may indicate incomplete coverage.* The proper primer thickness, as indicated by color of the applied SS-4004 or SS-4101 Primers, which will give the highest bond strength in a given application can easily be determined by trial and can then be reproduced in subsequent production operations.

Allow the primer to air dry for at least a half hour (an hour is better) before the RTV is applied. On porous surfaces a second coat of primer may be required; allow at least an hour drying time between coats.

Apply the RTV compound by laying it in place on the primed surface without severe rubbing which might disrupt the primer coating.

Bonding to cured silicone rubber surfaces (RTV or heat cured) generally does not require the use of a primer.

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* To assure satisfactory results, be sure to stir catalyst well before addition to base compound.

a new addition to G.E.'s line of proven RTV compounds

GENERAL PRODUCT INFORMATION

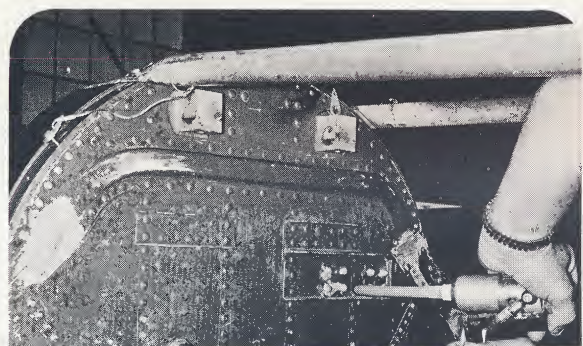
Only one elastomeric material has proved to be virtually immune to ozone, ultraviolet light, severe temperature change and oxidation through years of rough service. That material is silicone rubber. Originally developed by General Electric Research Laboratories silicone rubber has solved many design and engineering problems in both industrial and aerospace applications. The RTV-8000 series materials are a new addition to this line of proven RTV silicone rubber compounds. They were designed specifically to meet the performance and reliability standards established by MIL-S-23586 (Wep) and as other GE RTV Silicone Rubber Compounds, these new products provide:

- **RESISTANCE TO TEMPERATURE EXTREMES** — Retains elastomeric properties from -90°F to $+600^{\circ}\text{F}$ temperature range.
- **GOOD PHYSICAL AND ELECTRICAL PROPERTIES** — Physical toughness and insulating ability are maintained over a wide range of operating temperatures.

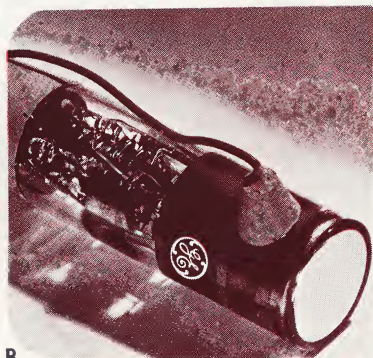
- **RESISTS OZONE, WEATHERING AND AGING** — RTV silicone rubber resists the effects of aging and environmental conditions that break down ordinary elastomers.
- **CHEMICAL RESISTANCE** — RTV resists attack from many common oils, solvents and chemicals.
- **GOOD BONDING ABILITY** — Adhesion to properly primed surfaces is stronger than the rubber itself.

In addition the RTV-8000 series specifically provides:

- **EASY TO MIX CATALYST TO COMPOUND RATIOS** — Convenient kit containing proper catalyst simplifies mixing.
- **PREVENTS COPPER CORROSION** — This system provides inhibition to copper corrosion, most important in electronic applications.
- **REVERSION RESISTANT CHARACTERISTICS** — RTV-8111 cures in deep sections and conforms to the reversion resistant requirements of MIL-S-23586 (Wep).



A



B



C

available in a range of viscosities for a variety of applications

A The thixotropic compounds which flow easily under pressure — yet do not sag or flow in place — were developed specifically for meeting stringent seating and caulking requirements.

B RTV compounds are 100% solids and thus do not shrink significantly on curing. When using moderate viscosity compounds for encapsulation, voids and stress on components are eliminated. Silicone rubber won't transmit shock and vibration as inflexible encapsulants do.

C Low viscosity RTV compounds are used to pot electrical components to provide environmental protection and reliable performance under adverse operating conditions. RTV compounds cure at room temperature without generating heat.

GENERAL APPLICATION AND HANDLING SUGGESTIONS (con't.)

Ordering Instructions

Specify quantity, container and product designation. When the product designation is given the proper amount and type of curing agent is automatically provided. Orders should be sent directly to General Electric Company, Silicone Products Department, Waterford, New York, or to the Silicone Products Department sales office nearest you.

Storage and Handling

All RTV compounds should be kept during storage in clean, covered containers at the lowest possible temperature (not above 80°F for extended periods).

The shelf life of RTV compounds will be in excess of the times indicated in the property table. Each package of General Electric RTV compound is stamped with a warranty expiration date and it is advisable to use the material before this date, although the useful shelf life should be somewhat longer. If material is used considerably later than the expiration date, it is advisable to test a small quantity to be sure that a proper cure can still be obtained. All curing agents exhibit shelf life equivalent to their respective products.

RTV compounds are non-toxic and completely safe to handle. However, care should be taken in handling curing agents and primers as covered above.

General Electric certification

General Electric RTV products in the RTV-8000 series are designed to meet the requirements of military specification MIL-S-23586 (Wep). The products conform to acceptance test requirements of this specification as shown below.

General Electric Specification Limits

PRODUCT RTV-8111 RTV-8112 RTV-8113 RTV-8223 RTV-8243 RTV-8262 RTV-8263 RTV-8372 RTV-8373 RTV-8382 RTV-8383

MIL-S-23586 (Wep) Acceptance Test Properties	RTV-8111	RTV-8112	RTV-8113	RTV-8223	RTV-8243	RTV-8262	RTV-8263	RTV-8372	RTV-8373	RTV-8382	RTV-8383
Viscosity, Poises	50-200	50-200	50-200	200-800	200-800	200-800	200-800	5000-20,000	5000-20,000	5000-20,000	5000-20,000
Pot Life	15-45 Minutes	1-3 Hours	3-7 Hours	3-7 Hours	3-7 Hours	1-3 Hours	3-7 Hours	1-3 Hours	3-7 Hours	1-3 Hours	3-7 Hours
Hardness, Shore A, Min.	40	40	40	45	45	45	45	45	45	45	45
Tensile Strength, psi, Min.	250	250	250	350	350	350	350	400	400	400	400
Elongation, %, Min.	100	100	100	100	100	100	100	100	100	100	100
Dielectric Strength, Volts/Mil Min.	400	400	400	400	400	400	400	400	400	400	400

Inasmuch as General Electric Company has no control over the use to which others may put the material, it does not guarantee that the same results as those described herein will be obtained. Each user of the material should make his own tests to determine the material's suitability for his own particular use. Statements concerning possible or suggested uses of the materials described herein are not to be construed as constituting a license under any General Electric patent covering such use or as recommendations for use of such materials in the infringement of any patent.



Hydrogen foaming. Fire danger?

S-3C-2

FILE WITH
DATA BOOK

supplementary data

S-3C

RTV-7 SILICONE RUBBER FOAM

General Electric RTV-7 Foam is a low density silicone sponge rubber which expands and vulcanizes at room temperature. Thorough mixing of the curing agent with the base compound initiates the chemical action. Within 10 minutes foaming and curing are complete and the cured foam may be handled. Like other silicone rubber materials, RTV Foam maintains its flexibility over a wide temperature range. It also has excellent electrical properties and good resistance to many chemical reagents.

Manufacturer's Specifications

Uncatalyzed Base Compound

Viscosity, Cps at 77 F	7000-9000
Color	Black
Specific Gravity	1.11 $\pm$.02
Shelf Life	3 Months

Cured RTV-7 Foam (5 Wt. % Stannous Octoate) 77F and 50 Percent RH

RTV Tack Free Time, Minutes	5 $\pm$ 2
Density, Max.	12.5 lb/ft ³

Some settling of the base compound normally occurs upon standing. To obtain uniform properties, thorough mixing should precede use.

Typical Properties of RTV-7 Foam

(These values are not for use in preparing product specifications)

CURED RTV FOAM

(100 parts of RTV-7 Foam mixed with five parts of catalyst. Samples cured 24 hours at 77 F and 50 percent RH.)

Density

Free Blown	= 12.5 lbs/ft ³
0.125 Inch Molded Slab	= 16.7 lbs/ft ³
*Tensile Strength	= 20 psi
*Elongation	= 70%

*Measured on ASTM dumbbells cut from an 0.080 inch thick molded slab.

Compression Set - (Molded sheets cured 48 hours at 77 F/50% RH.)

25% Compression for 22 Hrs/212 F	= 12%
50% Compression for 22 Hrs/212 F	= 9%
**50% Compression for 22 Hrs/212 F	= 5%

**(This sample given oven post cure of 1 hr/212 F before compression.)

Compression Deflection - (Cured 48 hours at 77 F/50% RH.)

0.125 inch molded slab.
10% Deflection = 0.5 psi load
25% Deflection = 1.0 psi load
50% Deflection = 2.8 psi load

Typical Electrical Properties - (Measured on 0.050 inch thick molded slab.)

Dielectric Strength	147 volts/mil
Dielectric Constant, 10 ² -10 ⁵ cps	1.8
Volume Resistivity	6.6 X 10 ¹⁵ ohm-cm

BLENDING

RTV-7 Foam is compatible with most General Electric RTV products. Variations in properties to fit a specific need may be obtained by adding up to 20 weight percent of another RTV silicone rubber compound to RTV-7 before catalyzation.

Typical Compression Deflection and Density Data - (as determined on the following RTV blend formulations)

RTV Blend Formulation	Sample Thickness	Compression	Deflection	Lbs/In	Density
		10%	25%	50%	Lbs/Ft ³
RTV-7	0.125"	0.5	1.0	2.9	16.7
RTV-7 + RTV-11 (100 Parts) (25 Parts)	0.125"	0.8	1.9	5.3	19.4
RTV-7 + RTV-60 (100 Parts) (25 Parts)	0.125"	0.8	1.7	5.7	21.2
RTV-7 + RTV-90 (100 Parts) (25 Parts)	0.125"	1.1	2.2	8.3	24.8

CATALYZATION

After mixing the base compound to uniformity, add five to eight weight percent curing agent. Stir vigorously for about 30 seconds. (RTV Foam may be stirred by hand or with mixing equipment specially designed for production line use.) The catalyzed compound begins to foam and cure as soon as mixing is begun and should be poured within 60 seconds from the start to mixing. Expansion and cure are complete within three to four minutes and the foam may be handled within 10 minutes. The time between mixing and cure may be extended by cooling the base compound before catalyzing. Variations of curing agent concentrations, between four and six weight percent, also provide further control of application time.

- Caution
1. RTV Foam is expanded via the evolution of hydrogen gas. The necessary precautions should be taken while the material is foaming.
 2. The curing agent contains stannous octoate which is known to irritate the eyes. Should some catalyst enter the eye, it should be flushed with large amounts of water and proper medical attention should be obtained.
 3. The curing agent is degraded upon exposure to air and moisture. When not in use the container should be kept tightly sealed.

APPLICATIONS/TECHNIQUES

RTV-7 low density silicone rubber foam is used for applications requiring:

1. Mechanical shock and vibration damping.
2. Cast in place thermal insulation.
3. Fabricated/Molded foamed rubber parts.
4. Light-weight electrical insulation.

Molding/Release

When foamed silicone rubber parts are desired, the use of a mold release is suggested for handling ease. Standard polytetrafluoroethylene sprays have been found to give optimum performance. Mold cavities are coated with this release agent before the catalyzed RTV Foam is poured into the molds.

Adhesion

Excellent adhesion of RTV-7 Foam to most substrates is obtained using standard G-E silicone primers such as SS-4004. Substrates to be bonded should be thoroughly cleaned followed by a brush coating of the primer and a usual one hour air dry. The RTV-7 may then be applied and allowed to cure. Foamed RTV-7 will achieve bond strengths exceeding the cohesive strength of the elastomer.

HANDLING AND STORAGE

The catalytic action of RTV-7 is such that it generates flammable gas on contact with acidic, basic, or oxidizing materials. Store in original containers with top up, in a cool place. The room temperature shelf life of this product is in excess of three months from date of shipment. Refrigeration at +40 F will increase shelf life. DO NOT FREEZE.

ORDERING INSTRUCTIONS

Specify quantity and product designation as indicated. Orders should be sent directly to General Electric Company, Silicone Products Dept., Waterford, N. Y., or to the Silicone Products Department sales office nearest you.